

# NASA TECH BRIEF

## *Goddard Space Flight Center*



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### Acoustical Analysis System

#### The problem:

Acoustical monitoring is a common way of detecting incipient failure in mechanical or fluid systems. Most often, several multipurpose instruments are needed to analyze the acoustical data and then detect and identify an incipient failure.

#### The solution:

A new integrated system replaces several instruments normally used to analyze the acoustical data. It was developed for use with another specific system which monitors hydraulic machinery (see Tech Brief 70-10116 for a description of that monitoring system). However, this versatile data analysis system may be used with most acoustical monitors.

#### How it's done:

The acoustical analysis system extracts and measures repetitive waveforms superimposed on a noisy background and compares their amplitude with internally stored waveforms. A commercially available "computer of average transients" (CAT) and two new components, an "analysis control module" and a "crest factor meter," are the major parts of the system.

The "analysis control module" regulates the acquisition of raw data and reproduces the processed data handled by the CAT. The control module regulates the amount of data to be processed, determines at what stage comparisons are to be made, and decides when readout and display are to occur. The control module is able to process input that is synchronized with a periodic machine motion or input that is varied progressively through preset levels.

The "crest factor meter" comprises an analog circuit which measures the peak and root-mean-square amplitudes of the input waveform. An automatic gain control amplifier, with a gain inversely proportional to the input level, precedes the waveform measuring circuits. This improves the overall accuracy by minimizing the dynamic range which succeeding circuits must handle. The calculated crest factor is displayed on a meter; when it exceeds a preset value, visible and audible alarms are set off.

All the equipment in this acoustical analysis system is designed so that, if required, it may be interfaced with a general purpose digital computer for completely automated analysis of the data. Controls and adjustments that are currently manually operated are wired to connectors that can interface with external hardware. Thus, the equipment will ultimately be capable of manual or automated control.

#### Note:

Requests for further information may be directed to:  
Technology Utilization Officer  
Goddard Space Flight Center  
Code 207.1  
Greenbelt, Maryland 20771  
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#### Patent status:

NASA has decided not to apply for a patent.

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